The Elimination of Subterranean Termite Damage by Structural Methods

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The author estimates that the subterranean termite (*Coptotermes formosanus* Shiraki) under ordinary conditions does 95 per cent of all termite damage in Hawaii. To control this termite should therefore eliminate 95 per cent of the termite damage. Authorities agree that the answer to the elimination of subterranean termite damage is structural practices. Dr. Thomas E. Snyder[2] in the second edition of his book "Our Enemy the Termite," page 163 states, "Proper construction is the answer to the termite problem," and on page 164 lists the most resistant type of construction as, "Houses the foundations or basements of which are entirely concrete, including baseboards, with cove or 'sanitary arc.'" In "How to Recognize and Control Termites in Illinois" B. C. Berger[3] in discussing structural methods to eliminate termite damage says, "All wood in the structure should be isolated so that termites cannot gain access to it without building shelter tubes in exposed places where they may be readily detected and the termites quickly destroyed by supplementary control measures."

The following three steps should eliminate damage by the subterranean termite if followed in future construction or applied to existing structures:

1. No wood in, or in contact with, the soil. This will eliminate any future colonies from becoming established. (See Figure 1.)

2. Several inches of concrete between soil or concrete floor at foundation level and wood of structure above. This should be designed in such a way as to force the termites to build a shelter tube between soil or concrete floor and wood where it can be seen by simple inspection (see Figures 2 and 3.)

3. Inspect periodically for shelter tubes and treat if found. (See Figure 4.) Treatment is made by inserting a small amount of insecticide dust into shelter tubes.

It is well to understand the essential points in the life history and habits of the termite upon which these three steps are based. The subterranean termite requires cellulose, which it usually obtains from wood, and moisture, which it obtains from the ground, in order to survive. The cellulose is broken down by microscopic organisms in the termites' alimentary tract into food elements which the termite can assimilate. The most essential use for the moisture is to raise the moisture content of the

[1]Entomologist, Fourteenth Naval District Public Works.

[2]Snyder, T. E. Our Enemy the Termite. Second Edition. Comstock Publishing Co., Ithaca. N. Y. 1948.

[3]Berger, B. G. How to Recognize and Control Termites in Illinois. Cir. 41 Nat. Hist. Sur. Urbana, Ill. 1947.

air in the termite nest and all its galleries so as to maintain a relative humidity of 90 per cent. In order to maintain proper moisture content in the tunnels of the wood where the termites are feeding, they will build shelter tubes of soil, chewed up wood, pellets of excrement, etc., over impervious material, such as rich concrete, or unpalatable material, such as resistant wood, between the soil where they obtain moisture and the wood they are feeding in.

Being social insects, termites have different castes specialized to carry on the different functions of the colony. The original queen, as well as alternate queens, produce all the eggs, males fertilize the queens, soldiers guard the colony against attack by enemies, and workers (and immature nymphs) do all the work for the colony. Soldiers and workers are potential, but sterile males and females, therefore, they never reproduce.

There are two types of reproduction among social insects; namely, the reproduction of the individuals of the colony and the reproduction of the colony itself. It is well to realize that it is the colony that we want to eliminate or control. In order to reproduce the colony, there is a season of the year when winged males and females are produced by the hundreds or thousands. Each pair (male and female) may start a new colony if the right environment is found. However, natural mortality is so high that only about one pair in 1,000 ever succeeds in starting a nest which results in a colony. The winged males and females fly for about 10 minutes; then the wings break off and the females (followed by a male) search for a suitable place to start a nest. The subterranean termite male and female must find cellulose (usually wood) and moisture in exactly the same spot or it will be impossible for them to start a nest. This is because the original pair must care for their young (only about 20) for the first year and cannot build a shelter tube for even a short distance to obtain moisture. It is estimated that it takes from 4 to 10 years for the progeny of an original pair to build up to where the colony will do appreciable damage to a building. Where damage occurs sooner than that in a new structure, it is because there is a termite colony already established in the vicinity.

Our first preventive measure, **no wood in, or in contact with, the soil,** is based on the fact that the original male and female swarming pair cannot establish a nest without cellulose (wood) and moisture in exactly the same spot. Therefore, stumps and large roots should be removed from the building site. No wood should be allowed to be buried in back fills. All grade stakes, form boards, wood blocks under plumbing in the soil should be removed as the building progresses. Porch steps, lattice work, built-on structures such as garages, water heater shelters, etc., should be watched for wood in contact with the soil. In the areas surrounding a building **no wood in, or in contact with, the soil** is also essential since termites will tunnel for long distances to obtain food. Parking bumpers, fence posts, and flower bed borders should be made of metal or concrete or have any wood well up off the ground.

Step 1 alone should eliminate termites in time, but because of man's shortcomings or carelessness and to aid in carrying out step 1, step 2 must be followed.

Step 2 is: **Several inches of concrete between soil or concrete floor at foundation level and wood of structure above.** This will force any termite colony present in the soil, or which may develop in the soil later, to build a shelter tube up over the concrete in the open where it can be seen. In carrying out step (2) there are two types of buildings to consider as illustrated in drawings, Figures 2 and 3.

a. Figure 2 shows the type of building where the floor is up off the ground and since subterranean termite control must be carried out at the ground level, we go beneath the floor to get proper construction to eliminate termites in this type of structure. The first requirement is to make

FIGURE 1

This shows where form boards were removed except where they "wouldn't show" under porch. Where form boards were in contact with soil, a large colony of subterranean termites developed and did several thousands of dollars damage to the building.

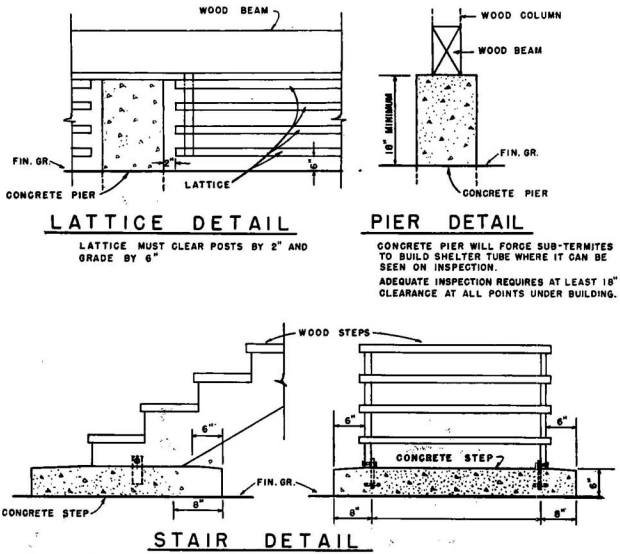

FIGURE 2

This drawing shows type of building where floor is above ground. Note how termites may not attack wood without building shelter tube (as shown in Figure 4) from soil up over concrete. In this type of structure all necessary precautions against termite damage are taken below the floor. Proper construction below the floor saves all money for termite shields, and for resistant or treated lumber above floor.

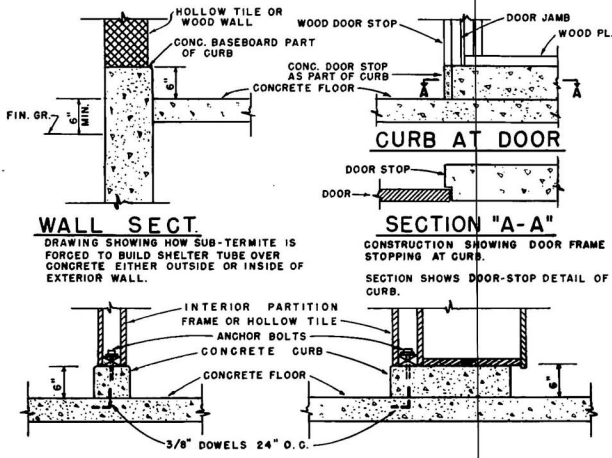
HOLLOW TILE OR WOOD WALL
CONC. BASEBOARD PART OF CURB
CONCRETE FLOOR
FIN. GR.
6" MIN
WOOD DOOR STOP
DOOR JAMB
WOOD PL.
CONC. DOOR STOP AS PART OF CURB
CURB AT DOOR
DOOR STOP
DOOR
WALL SECT.
DRAWING SHOWING HOW SUB-TERMITE IS FORCED TO BUILD SHELTER TUBE OVER CONCRETE EITHER OUTSIDE OR INSIDE OF EXTERIOR WALL.
SECTION "A-A"
CONSTRUCTION SHOWING DOOR FRAME STOPPING AT CURB.
SECTION SHOWS DOOR-STOP DETAIL OF CURB.
INTERIOR PARTITION FRAME OR HOLLOW TILE
ANCHOR BOLTS
CONCRETE CURB
CONCRETE FLOOR
3/8" DOWELS 24" O.C.
INT. WALL SECT.
PARTITION SHOWING HOW SUB-TERMITE IS FORCED TO BUILD EXPOSED SHELTER TUBE OVER CONCRETE CURB TO GET TO WOOD IN PARTITION.
BUILT-IN CABINETS
BUILT-IN CABINET CONSTRUCTION FORCING SUB-TERMITE TO BUILD EXPOSED SHELTER TUBE OVER CONCRETE TO GET TO WOOD IN CABINET.
STANDARDS FOR TERMITE PROTECTION

FIGURE 3

This drawing shows type of structure where concrete floor rests on soil. Termite resistant principles must be taken above floor to isolate wood from expansion joints or cracks in floor which would provide termites with a hidden entrance. In this type of structure expense for resistant or treated wood can also be saved.

sure the building is well up off the ground at all points so as to make inspection (Step 3) readily possible. There should be a clearance of 24 inches with no point or clearance less than 18 inches. There should be several inches of rich concrete between the soil and any weight-bearing timbers, including steps or other built on structures, extending above any possible future grade. Hollow tile should have rich concrete between it and any soil since termites can usually find a crack in the mortar between tiles, and the hollow gives them an ideal hidden entrance. Filling the void in hollow tile with mortar for a few courses is not sufficient. It is sufficient to cap the top of hollow tile below any wood with several inches of reinforced concrete as is done in some construction.

Such a concrete binder which extends only beneath a window, however, does not protect against termites entering the window through hollow tile at the sides or tops, if the tile reaches the soil. Wood lattice work should clear the soil by several inches and not nullify proper construction at steps or porches.

b. Figure 3 shows the second and only other type of structure in the prevention of subterranean termite damage. This is where we have a concrete slab or floor resting on the ground. With this type of structure, in order to comply with step 2, we must have our several inches of concrete above the floor to force the termites to build shelter tubes where they can be readily seen and treated. Principles for this type of construction are shown in Figure 3. This type of construction usually has a curb wall around the outside; but on the inside, baseboards, door frames, partitions, cabinets, stairs, etc., rest on the floor giving termites a hidden entrance from expansion joints, cracks in the floor, etc., to wood. Outside curb walls should form a part of the door frame as shown in Figure 3; and partitions, bottom stair steps, and cabinets should be up on concrete curbs.

It is relatively easy to understand the critical points to watch to force subterranean termites to construct their shelter tubes where they can be seen in the building type where the floor is well up off the ground (Figure 2). Concrete or air space between the soil and any wood of the structure and sufficient elevation to give crawl space for inspection and possible treatment of shelter tubes are the main things to watch. Elevation at the highest grade point is perhaps the most often violated. Allowance must be made for future grades or fills.

The critical points to watch in the type of structure where the floor is a concrete slab resting on the ground (Figure 3) may take a little more care. These are the base boards of all side walls, partitions and cabinets with especial emphasis at the door frame bases. All curbs should form a part of the base of the door frame. The base of the door frame is the principle most often violated. Many buildings have curbs under side walls and partitions but the curb is carefully stopped to permit the door frame to go down to the expansion joint between the side wall curb and concrete floor. The door frame then provides the termites with a hidden entrance to the structure above. There are many instances where if the concrete curb had formed a part of the door frame thousands of dollars from subterranean termite damage would have been saved.

c. Step 3 is simple — **look for shelter tubes and if found treat them by breaking tube and inserting Paris Green dust, DDT dust 50%, Chlordane dust or any other of many suitable insecticide dusts.** The frequency of inspection should be determined by the presence of termites in the area, but should not be less than once each year.

FIGURE 4

This shows how concrete construction forced termites to build an earthen shelter tube in the open in order to reach wood in the structure above. Note how termite shield did not prevent termites from reaching wood and, therefore, gives a false sense of security. With concrete between soil and wood of structure a simple inspection will reassure owner that no termite damage exists even several stories up in structure if no shelter tube is found.

Original cost of termite resistant structures cheaper.

"Cheaper in the long run" is easy to believe, but to say the original cost is cheaper may require some explanation. If this type of construction is followed, the cost for metal termite shields and resistant or treated lumber in the structure can be saved. Also by forming a baseboard as a part of all outside concrete wall curbs and partitions, finish-lumber can be saved. Money can also be saved by omitting any soil treatment prior to building since, if properly constructed, shelter tubes will have to be constructed in the open where simple treatment will eliminate them.